



Mediterranean Gastrochaenidae (Mollusca: Bivalvia)

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ABSTRACT The systematic arrangement of Mediterranean Gastrochaenidae is discussed. *Gastrochaena conchyliophila* Pallary, 1900 is here considered a junior synonym of *Gastrochaena dubia* (Pennant, 1777).

RIASSUNTO Viene discussa la sistematica della famiglia Gastrochaenidae in Mediterraneo. *Cucurbitula cymbium* (Spengler, 1783), specie lessepsiana rinvenuta finora in Mediterraneo lungo le coste di Israele, è caratterizzata da valve subrettangolari e dall'abitudine di costruire un nido calcareo segmentato e liscio. *Gastrochaena dubia* (Pennant, 1777), specie ad ampia distribuzione atlantica e mediterranea, possiede valve ovali. Generalmente vive all'interno di rocce, ma è in grado di costruire nidi calcarei sia attaccati ad oggetti solidi che a sé stanti. Questi nidi sono comunque ben diversi da quelli di *Cucurbitula cymbium* in quanto non segmentati e costituiti da tubercoli calcarei prodotti dall'animale e da detriti. *Gastrochaena conchyliophila* Pallary, 1900, specie descritta per l'Algeria e segnalata dal Marocco, è ritenuta sinonimo juniore di *Gastrochaena dubia* in seguito allo studio del materiale conservato nella collezione Dautzenberg presente nell'Institut Royal des Sciences Naturelles de Belgique di Bruxelles.

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INTRODUCTION

The most recent catalogue of Mediterranean molluscs (SABELLI, *et al.*, 1990) and its update (CHIARELLI, 1999 - "Nuovo catalogo delle conchiglie marine del Mediterraneo" (the file can be downloaded at <http://www.aicon.com/sim/download.html>) list three species of Gastrochaenidae:

Gastrochaena conchyliophila Pallary, 1900

Gastrochaena cymbium Spengler, 1783

Gastrochaena dubia (Pennant, 1777)

Here a new systematic arrangement of the family is proposed:

Family Gastrochaenidae Gray J.E., 1840

Genus *Cucurbitula* Gould, 1861

Cucurbitula cymbium Spengler, 1783

Genus *Gastrochaena* Spengler, 1783

Gastrochaena dubia Pennant, 1777

= *Gastrochaena conchyliophila* Pallary, 1900

DISCUSSION

Genus *Cucurbitula* Gould, 1861

Type species: *Fistulana lagenula* Lamarck, 1801 [= *Gastrochaena cymbium* Spengler, 1783]

Remarks: OLIVER (1992) described the genus concisely: "Shell oblong with a pronounced anterior margin. Forming a sectioned calcareous case cemented to dead shells."

Cucurbitula cymbium (Spengler, 1793)

Fig. 2, 7-8, 16

Description: Valves subrectangular, dorsal and ventral margin almost parallel. Sculpture of growth lines usually more evident anteriorly.

Habitat: This species inhabits offshore infralittoral soft bottoms where it builds up a calcareous case (fig. 2, 16) attached to hard

objects, often old bivalves. The case is segmented with every segment smooth. It rarely contains sand grains or coarser material.

Distribution: *C. cymbium* is a lessepsian immigrant (BARASH & DANIN, 1972). The Mediterranean distribution appears to be limited to the Israeli coast. Elsewhere it is a widespread Indo-Pacific species (OLIVER, 1992).

Genus *Gastrochaena* Spengler, 1783

Type species: *Gastrochaena cuneiformis* Spengler, 1783

Remarks: OLIVER'S (1992) description of the genus is: "Cavity flask shaped, siphonal openings fused. Small shells. Equivalve. Strongly inequilateral, beaks close to the anterior. Widely gaping antero-ventrally. Outline elongate narrowly elliptical cut away antero-ventrally. Hinge edentulous. Sculpture of closely set sharp concentric ridges".

Gastrochaena dubia Pennant, 1777

Fig. 5-6, 9-15, 17

Description: Valves ovate in outline, dorsal and ventral margins convex. Sculpture of growth lines, generally coarser anteriorly where a short radial depression near the umbo may be present.

Habitat: Bored in rocks and other hard objects such as dead shells, intertidally to infralittoral depths. It usually builds up calcareous siphonal tubes which have growth striae. Small stones and other objects are rarely cemented to them. When it bores into shells it frequently builds up a case to protect itself (fig. 15, 17).

Remarks: This encasing ability was already observed in the 19th century. JEFFREYS (1865) recorded the family Gastrochaenidae in British waters: "The only species which we possess (*G. dubia*) excavates and encases itself in limestone, new-red sandstone, and old shells; sometimes the case is found free, and incrustated with fragments of shells and grains of sand". WOODWARD (1880) wrote in the description of

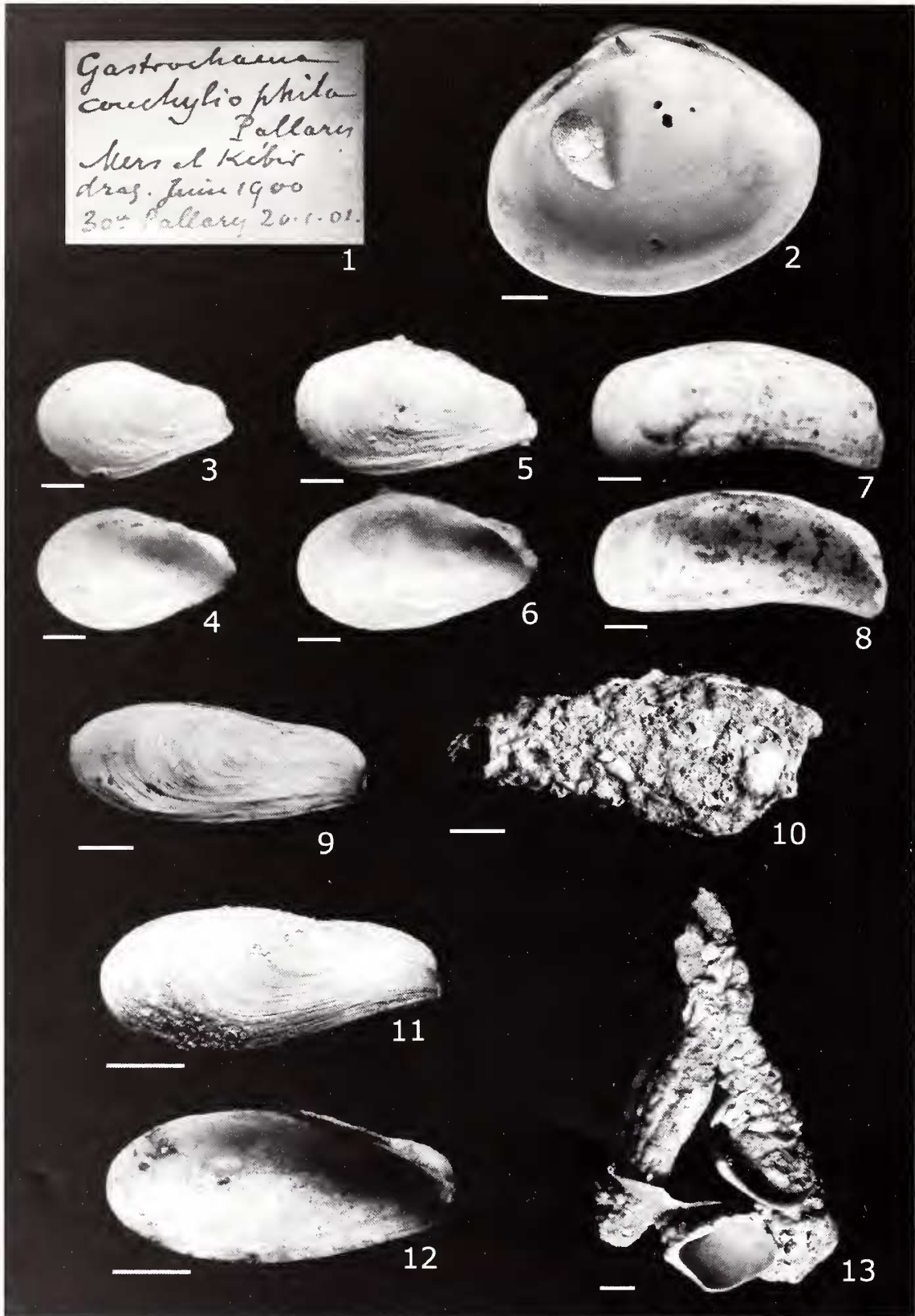


Plate 1. Fig. 1: original label of *Gastrochaena conchyliophila* Pallary, 1900, Dautzenberg collection in Bruxelles. - Fig. 2: case of *Cucurbitula cymbium* (Spengler, 1783) (Mediterranean coast of Israel). - Fig. 3-4: *Gastrochaena conchyliophila* Pallary, 1900, Dautzenberg collection (Algeria, Mers el Kebir) - Fig. 5-6: *Gastrochaena dubia* Pennant, 1777 (North Adriatic Sea, 15 miles off Chioggia, -17/20 m, encased in a *Laevicardium oblongum* valve) - Fig. 7-8: *Cucurbitula cymbium* (Spengler, 1783) (Israel, Haifa Bay, dredged, 40m, encased on a valve fragment) - Fig. 9: *Gastrochaena dubia* Pennant, 1777 (fossil specimen, Pliocene, Spicchio, Empoli, Toscana) - Fig. 10: *Gastrochaena dubia* Pennant, 1777 (case of fossil specimen of previous figure) - Fig. 11-12: *Gastrochaena dubia* Pennant, 1777 (Spain, Ebro river delta) - Fig. 13: *Gastrochaena dubia* Pennant, 1777 (Spain, Ebro river delta, case of specimen of previous figures) - Scale bars: figs. 3, 4, 5, 6, 7, 8: 1 mm; figs. 2, 9, 10, 11, 12, 13: 5 mm.



Gastrochaena modiolina Lamarck, 1818 (= *G. dubia*): "When burrowing in oyster-shells it often passes quite through into the ground below, and then completes its adobe by cementing such loose material as it finds into a flask-shaped case, having its neck fixed in the oyster shell..."

COEN & VATOVA (1932) described this habit for Mediterranean specimens collected off Rovinj (Croatia, Northeastern Adriatic Sea): "...vive nelle cavità delle pietre o in capsule calcaree poste nell'interno di Bivalvi morti, che fora sporgendo i sifoni, rivestiti pure di un involucro calcareo... [...it lives in stones or in calcareous capsules on dead bivalves, passing through them it builds up calcareous siphonal canals...]". COEN (1937) described specimens from the Venice Lagoon: "Degno di nota è il fatto che nella Laguna Veneta si trova la sp. frequente, ma soltanto in valve morte di *Venus verrucosa*, entro una "cucurbitula" avventizia calcarea interna alle valve della *Venus*, sulla cui superficie esterna osservasi solo un piccolo foro. In nessun altro caso, né su altra specie, trovai mai le *Gastrochaena* in Laguna. [It is worthwhile to mention that the species is common in the Venice Lagoon, but only in dead *Venus verrucosa*, in a calcareous case on the inner side of the valves. Only a small hole is visible on the outer side of the valve. Nowhere else I ever found *Gastrochaena* in the Lagoon]".

Past authors have well defined the ability of *Gastrochaena dubia*. The cases are generally composed by calcareous tubercles composed of many layers produced by the animal. Sand grains and other debris are often cemented too. Again it is worthwhile to quote JEFFREYS (1865): "I have a cluster of a dozen *G. dubia* in a single oyster-shell. The case or crypt is thick and composed of a great many layers. The exposed part of it is formed of tubercular concretions of different shapes and sizes..."

The cases may be cemented to the host shell or attached to it only by the siphonal canal. The species is also able to build up cases without being connected to any hard object.

This is a remarkable adaptation of the species to soft bottoms where it can't find suitable hard substrates to bore. The Author has been able to observe many specimens from the Northern Adriatic Sea where the species is frequently dredged offshore. Most of the old valves and shells found on fishing boats operating in the area are colonized by encased *G. dubia*. Similar specimens were found in the Tyrrhenian Sea in fishermen's nets operating in 20/30m off S. Marinella (Rome). Conspicuous lonely cases have been found off the delta of Ebro river (Spain) (fig. 11-13) and off Grado (Northern Adriatic) (fig. 14).

The Author has also observed an interesting fossil specimen (fig. 9-10) with a case similar to recent specimens from Ebro river and off Grado. SACCO (1901) recorded: "Questa specie tanto abbondante nei depositi litoranei si presenta sia in valve libere, sia sotto forma di astucci claviformi risultanti da un agglomerato di svariati corpuscoli organici ed inorganici, sia sotto forma di moduli entro calcari, specialmente crasse valve di vecchie ostriche. [This species is abundant in coastal sediments as loose valves or as flask-shaped cases composed by organic and inorganic debris or in coarse old *Ostrea* valves]". However, it is worthwhile to remember that sometimes fossil nests and cases may be found alone even if they were originally built up in the hard sediment. The matrix may have dissolved and only the nest left. So it is more difficult to draw conclusions on the actual ecology of these fossil specimens.

Fossil flask-shaped cavities made by *Gastrochaena dubia* are also

recorded in D'ALESSANDRO *et al.*, 1979 from Cagnano Bagno (Campobasso). This reference also gives the fossil distribution of the species which I quote hereunder: "(?) Langhiano della Cirenaiaca; "Elveziano" di Giarabub e Aquitania; "Elveziano-Astiano" del bacino ligure-piemontese; Miocene medio del bacino di Vienna; Pliocene della Valle del Rodano, di Anversa, Emilia-Romagna, Toscana, Calabria, Sicilia; Pleistocene della Sardegna, Monte Mario, Calabria."

Despite this species being able to build a case, I would confirm its inclusion in the genus *Gastrochaena* Spengler, 1783. The cases are different from those of *Cucurbitula cymbium* Spengler, 1783, the former being homogeneous and tubercled, the latter being segmented and smooth. The Author observed many specimens of both species and case characteristics are very constant. Moreover valves are also sufficiently different to avoid any species misidentification.

The ability to build up a case has been recently forgotten for *G. dubia*. Most of the *Cucurbitula cymbium* reports from other Mediterranean localities than Israeli coasts, whose identifications were just based on the presence of a case, are most probably cased *Gastrochaena dubia*.

Distribution: It is a widespread Mediterranean species, also present in the Northeastern Atlantic from the British Islands (JEFFREYS, 1865) to Morocco (PALLARY, 1920) and even to South Africa (*vide* TEBBLE, 1976), but such southern records should be confirmed.

Gastrochaena conchyliophila Pallary, 1900

Fig. 1, 3-4

Description: Quoting from the original description: "*Les Gastrochaena* ne nous semblent pas suffisamment étudiés. Nous ne possédons deux formes qui nous paraissent appartenir à deux espèces distinctes: l'une de petite taille, trapézoïde, haute, à bord antérieur plus développé et plus relevé que chez l'autre; sa taille est minime, les plus grands exemplaires ont 5mm de hauteur sur 3 de largeur. Elle perce surtout les gros *Pectunculus*. C'est à cette forme qu'appartient le spécimen de Beni Saf (collection Koch); il ne s'agit pas d'un jeune exemplaire car le sujet en question avait déjà formé son tube. Nous possédons aussi des valves de *P. bimaculatus* très épaisses, percées de trous qui ont certainement été creusés par cette espèce. Sur un espèce de deux centimètres carrés on peut compter près de vingt ouvertures de *Gastrochènes*. Si cette forme n'a pas encore été décrite nous proposons de la nommer *G. conchyliophila*. Ce *Gastrochaena* possède un canal très long, souvent flexueux, à peine plus large à la base qu'à l'ouverture et rarement enduit. Ce canal est toujours très finement strié en travers. Nous avons observé cette curieuse forme sur des *Pectunculus*, *Purpura*, *Spondylus*, *Conus* et *Mytilus*."

Distribution: *Gastrochaena conchyliophila* Pallary, 1900 is known from the type locality, Oran (Algeria), and from Morocco (PALLARY, 1920 and PASTEUR-HUMBERT, 1962).

Remarks: The author was not able to trace the holotype. It is not present in the Museum National d'Histoire Naturelle, Paris (V. HEROS 12.03.99, in litt.) nor in the British Museum Natural History, London (K. WAY 20.05.99, in litt.). In the Dautzenberg collection, Institut Royal des Sciences Naturelles de Belgique, Bruxelles, a lot of this species is present (I.G. 10591) (fig. 1, 3-4). It contains two vials. The first one is labelled: "Mers el Kébir, drag. 30 m, Juin 1900, Pallary det. [or "ded." ?] 20.01.01", the

second "Oran, Pallary in Coll. Guinut, 29.V.01". The eleven specimens are well preserved, some with dried animals inside. All specimens range from 3 to 5 mm. Unfortunately, there is not any sample of the habitat where the specimens may have bored. Another very fresh specimen is present in the Montetosato collection in Rome. It also has a label reporting it was collected off Algeria: "Dragages effectués par M. Paul Pallary sur la cote ouest de l'Algérie. Golfe d'Oran 30-40 metres". On this label "in situ" is also written, but in the box there is not any trace of rock or dead shell where the specimen may have bored.

It is not possible to note any difference between these specimens and typical *Gastrochaena dubia* specimens. General outline, sculpture, and any other morphological characteristic is identical. Any difference may be reconduced to infraspecific variability. The smaller size is not significant. Most of the Adriatic encased *G. dubia* specimens are smaller than specimens living in rocky bottoms too.

In the Author's opinion *Gastrochaena conchyliophila* is a junior synonym of *Gastrochaena dubia*.

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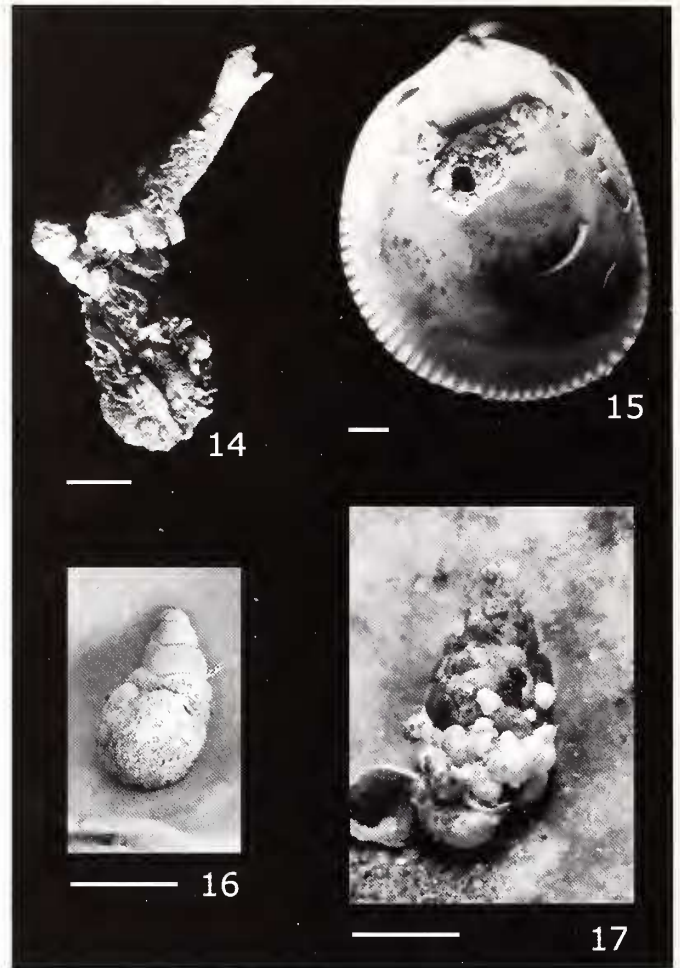


Plate 2. Fig. 14: *Gastrochaena dubia* Pennant, 1777 (North Adriatic Sea, off Grado) - Fig. 15: *Gastrochaena dubia* Pennant, 1777 (North Adriatic Sea, 15 miles off Chioggia, -17/20m, encased on *Laevicardium oblongum*) - Fig 16: case of *Cucurbitula cymbium* Spengler, 1783 (Mediterranean coast of Israel, close up view of figure 2 - Fig 17: *Gastrochaena dubia* Pennant, 1777 (North Adriatic Sea, off Chioggia, -20m; encased on *Mytilus*) - Scale bar: 5 mm.

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